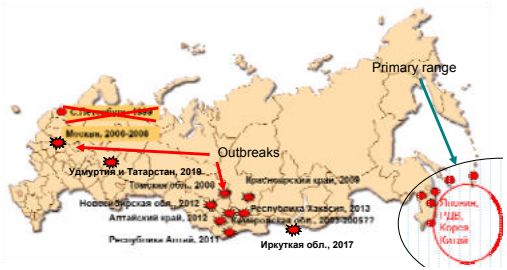
An old remedy for a new problem: submersion of logs to prevent emergence of invasive bark beetle adults

A.A. Efremenko, D.A. Demidko, Yu.N. Baranchikov

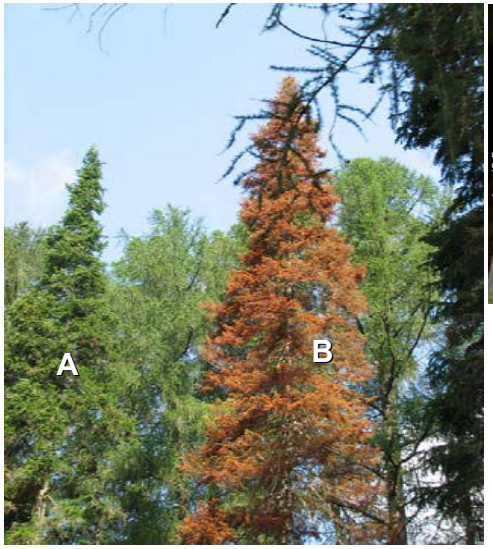
V.N. Sukachev Institute of Forest FRC KSC SB RASci, Krasnoyarsk

Beetles of *Polygraphus proximus* near an entrance hole of its nest.

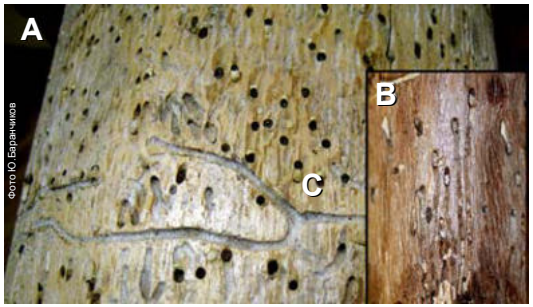
Four-eyed fir bark beetle (FFBB) - *Polygraphus proximus* Blandf. (Coleoptera, Curculionidae, Scolytinae) - a Far Eastern bark beetle that relatively recently entered the territory of Southern Siberia - in a short time formed many centers of outbreaks in stands with the participation of Siberian fir *Abies sibirica* Ledeb. Not differing in significant aggressiveness towards the species of fir native to its primary range, FFBB demonstrated the ability to successfully overcome the defense mechanisms of the trees of the new host, which do not have vivid signs of weakening. The invader turned out to be able not only to lead to the degradation of fir forests as a separate forest formation, but also to create a local threat to the existence of Siberian fir as a species (Krivets et al., 2015).



Primary and secondary ranges of *Polygraphus proximus* in Russia (region and time of first registration).



Invasive tandem bark beetle – ophiostomal fungus *Grosmannia aoshimae* can kill healthy fir tree in 2-4 years after first attack. (A) 1-2-nd year of attack; (B) 3-rd year of attack (end of August).



Pupal chambers of FFBB after beetles emergence (A) and before emergence (B), packed with dust. Beetle galleries (C).

Developmental stages of FFBB: larva (а), pupa (б) and beetles (в) male and female (photo by I. Kerchev).

We evaluated the traditional practice of storing fir logs submerged in water (Rukovodstvo, 1996) as a possible ecology-friendly method for killing within-tree individuals of FFBB

A Siberian fir tree infested with overwintering FFBB larvae and beetles was felled and cut into 20-cm bolts. These bolts were submerged in buckets with cold water (18–20° C) for different periods of time in the laboratory and, after the treatment, placed into rearing tubes to determine survival and adult emergence.

All FFBB stages of development died in the logs submerged for 3 weeks or longer and only 14% of adults survived in logs submerged for 2 weeks.

20-sm bolts of Siberian fir submerged in buckets with cold water for 1 to 4 weeks (3 bolts for each treatment).

Funding. The work was supported by the RFBR (grant № 17-04-01765).

References

Krivets S.A., Kerchev I.A., Bisirova E.M., Demidko D.A., Pet'ko V.M., Baranchikov Yu.N. Distribution of the four-eyed fir bark beetle Polygraphus proximus Blandford (Coleoptera, Curculionidae: Scolytinae) in Siberia. Izvestia Sankt-Peterburgskoj Lesotehnicheskoj Akademii. 2015. Vol. 211: 33–45 (in Russian).

Rukovodstvo po zaschite khvoiniy drevesiny ot vrednikh nasekomykh. Moscow: VNIITslesresurs. 1996. 17 p. (in Russian).